*8.4. Refer to **Muscle mass** Problem 1.27. Second-order regression model (8.2) with independent normal error terms is expected to be appropriate.

a. Fit regression model (8.2). Plot the fitted regression function and the data. Does the quadratic regression function appear to be a good fit here? Find R^2.

b. Test whether or not there is a regression relation; use $\alpha = .05$. State the alternatives, decision rule, and conclusion.

c. Estimate the mean muscle mass for women aged 48 years; use a 95 percent confidence interval. Interpret your interval.

d. Predict the muscle mass for a woman whose age is 48 years; use a 95 percent prediction interval. Interpret your interval.

e. Test whether the quadratic term can be dropped from the regression model; use $\alpha = .05$. State the alternatives, decision rule, and conclusion.

f. Express the fitted regression function obtained in part (a) in terms of the original variable X.

g. Calculate the coefficient of simple correlation between X and X^2 and between x and x^2. Is the use of a centered variable helpful here?

*8.5. Refer to **Muscle mass** Problems 1.27 and 8.4.

a. Obtain the residuals from the fit in 8.4a and plot them against $\hat{Y}$ and against x on separate graphs. Also prepare a normal probability plot. Interpret your plots.

b. Test formally for lack of fit of the quadratic regression function; use $\alpha = .05$. State the alternatives, decision rule, and conclusion. What assumptions did you make implicitly in this test?

c. Fit third-order model (8.6) and test whether or not $\beta_{111} = 0$; use $\alpha = .05$. State the alternatives, decision rule, and conclusion. Is your conclusion consistent with your finding in part (b)?